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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,111	07/11/2003	James D.B. Smith	2003P08574US	4106

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Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER

FEELY, MICHAEL J

ART UNIT	PAPER NUMBER
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1712

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/28/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/618,111

Applicant(s)

SMITH, JAMES D.B.

Examiner

Michael J. Feely

Art Unit

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on November 20, 2006 has been entered.

Pending Claims

2. Claims 20 and 21 are pending.

Response to Amendment

3. The rejection of claims 1-9 and 11-19 under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US Pat. No. 5,904,984) in view of Cook et al. (US Pat. No. 6,369,183) has been rendered moot by the cancellation of these claims.

4. The rejection of claim 10 under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (US Pat. No. 5,904,984) and Cook et al. (US Pat. No. 6,369,183) in view of Stackhouse et al. (US Pat. No. 4,427,740) has been rendered moot by the cancellation of this claim.

Art Unit: 1712

5. The declaration under 37 CFR 1.132 filed November 20, 2006 is insufficient to overcome any potential rejection of claims 20 and 21 based upon the combined teachings of Smith et al. (US Pat. No. 5,904,984) and Cook et al. (US Pat. No. 6,369,183).

In items 5-8 of the declaration, Mr. Smith makes a series of statements as to why the teachings of Cook et al. would destroy or not work with the teachings of Smith et al. However, Mr. Smith has provided not data to substantiate his claims. Furthermore, the portions of Cook cited by Mr. Smith are not necessarily required in the combined teachings.

- In statement 5, Mr. Smith states that the *amine-functionalized carboxylate-alumoxanes* used by Cook would have caused disruption of the crystalline structure of the Smith epoxy compounds. It is unclear if this is the case; however, Cook also teaches the use of *hydroxyl-functionalized carboxylate-alumoxanes*, which correspond to the materials used in the instant invention. These materials, not the amine-functionalized materials, are pertinent to the previous and instant prior art rejections.
- In statement 6, Mr. Smith states that *formaldehyde* used by Cook would not have been compatible with Smith epoxy compounds. There is no mention of formaldehyde at column 10, line 56 of Cook.
- In statement 7, Mr. Smith states that *water, waterborne systems, and the ethanol cold water drop* used by Cook would have destroyed the crystalline structure of the Smith epoxy compounds. It is unclear if this is the case; however, the teachings of Cook are not limited to these aqueous systems. *Non-aqueous* systems, not the aqueous systems, are pertinent to the previous and instant prior art rejections.

Art Unit: 1712

- In statement 8, Mr. Smith states that the *alternatives to covalent bonding* would have a detrimental effect on the Smith materials. It is unclear if this is the case; however, the teachings of Cook are primarily directed to *covalent* bonding reactions, which correspond to the reactions present in the instant invention. These reaction mechanisms, not the alternative reaction mechanisms, are pertinent to the previous and instant prior art rejections.

In conclusion, it should be noted that a prior art reference typically contains multiple embodiments. Not all of these embodiments may be relevant to a prior art rejection, and by no means do these irrelevant embodiments disqualify the reference as a whole. The statements of Mr. Smith have isolated alternative embodiments of Cook that he believes are inoperable with the teachings of Smith. Without any data to substantiate these claims, it cannot be determined if these statements are accurate. Furthermore, assuming accuracy of these statements, the inoperability of these alternative embodiments does not take away from the embodiments that are relevant to the instant claims. To say that these relevant embodiments are inoperable suggests that the instant invention, itself, is inoperable.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1712

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Smith et al. (US Pat. No. 5,904,984) and Cook et al. (US Pat. No. 6,369,183) in view of Mertens et al. (US Pat. No. 3,369,947).

Regarding claims 20 and 21, Smith et al. disclose: **(20)** an LCT-epoxy polymer (column 2, line 22 through column 5, line 19) comprising a crystalline microstructure having a layered nature (column 5, lines 20-41) and a process comprising the steps of: (a) mixing at least one anhydriding agent with said LCT-epoxy polymer (column 5, lines 20-56); and (b) curing the mixture with an accelerator (column 9, line 34 through column 10, line 7; Table III: column 8, lines 20-48) to produce homogeneous polymers that retain the layered nature of the LCT-epoxy resin (column 5, lines 20-45); and **(21)** a homogeneous polymer produced by the method of claim 20 (column 5, lines 20-45).

The composition of Smith et al. also contains inorganic particulate filler, including aluminum-based fillers, to improve the electrical properties of the resin (column 6, lines 45-50). However, the teachings of Smith et al. are deficient in that they do not teach: **(20)** a method of making a homogeneous alumoxane-LCT-epoxy polymer comprising:

Art Unit: 1712

- Mixing at least one boehmite material with the LCT-epoxy resin and the anhydriding agent under conditions to form a uniform dispersion and an essentially complete co-reactivity of the boehmite material with the LCT-epoxy resin;
- Curing the mixture to produce the homogeneous alumoxane-LCT-epoxy polymer; wherein the alumoxane-LCT-epoxy polymer has a dielectric strength of at least 1.2 kV/mil; and wherein the alumoxane-LCT-epoxy polymer has a thermal conductivity in the traverse direction of at least 0.50 W/mK and in the thickness direction of at least 0.99 W/mK in an environment of 25°C; and
- Curing with a zinc naphthenate accelerator.

With respect to the first two bullet points, Cook et al. disclose a method of forming hybrid polymers and resins in which at least one component is a chemically modified carboxylate-alumoxane. The carboxylate-alumoxanes are chemically bonded into the polymer backbone through reaction of the appropriate functional groups of a polymer precursor with the carboxylate-alumoxane (see column 1, lines 14-21). This method is an alternative to the standard practice of adding filler to resin systems in order to enhance properties, such as thermal conductivity (see Background of the Invention: specifically column 1, line 52 through column 2, line 54; column 3, line 37 through column 4, line 16; column 6, lines 13-16). This method also avoids handling and dispersion problems, including phase separation and agglomeration of the filler in the polymer composite (see column 1, line 52 through column 2, line 54). This method can be applied to numerous polymer materials, including epoxy resins. The reaction mechanism can be found in Figure 10.

Art Unit: 1712

Essentially, Cook et al. disclose: (20) a method of making a homogeneous alumoxane-epoxy polymer comprising: (a) mixing at least one boehmite material (carboxylate-alumoxane) with the epoxy resin or epoxy/hardener system under conditions to form a uniform dispersion and an essentially complete co-reactivity of the boehmite material with the epoxy resin (column 11, line 29 through column 12, line 51; Figures 10 & 11); and (b) curing the mixture to produce the homogeneous alumoxane-epoxy polymer (column 11, lines 29-51; Figures 7-9); and (21) a homogeneous alumoxane-epoxy polymer (column 11, lines 29-51; Figures 7-9).

Cook et al. do not mention the use of LCT-epoxy polymers; however, they disclose, “Although we have demonstrated the formation of alumoxane-epoxy composites using commercial resins such as Dow Chemical’s DER 332, combinations of DER 332 and DER 732, Union Carbide’s ERL (cycloaliphatic resin), and Shell’s EPI-REZ (a waterborne resin system), any commercially available epoxy resin can be used to prepare the carboxylate-alumoxane/epoxy polymer hybrid materials,” (column 12, lines 11-17). In light of this, LCT-epoxy polymers would have fallen under this umbrella of suitable materials – see *MPEP 2144.07*. Furthermore, one skilled in the art would have been motivated to employ this method in the method of Smith et al. in order to avoid the drawbacks of physically adding filler materials, especially aluminum-based filler materials, to their LCT-epoxy polymer compositions.

Lastly, the combined teachings of Smith et al. and Cook et al. are silent regarding dielectric strength and conductivity of the alumoxane-LCT-epoxy polymers. However, it appears that if one skilled in the art were to apply the technique of Cook et al. using the LCT-epoxy polymers of Smith et al., this property would have been an inherent result of the reaction between the carboxylate-alumoxane and the LCT-epoxy polymer – see *MPEP 2112.01 II*.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the technique of reacting a carboxylate-alumoxane with an epoxy resin to form a hybrid epoxy resin, as taught by Cook et al., with the LCT-epoxy resins of Smith et al. because the teachings of Cook et al. extend to all commercially available epoxy resins, resulting in a hybrid polymer having a desired set of properties provided by the alumoxane. This technique is an alternative to the standard practice of adding filler to resin systems and it also avoids handling and dispersion problems of filler materials, including phase separation and agglomeration of filler in the polymer composite.

With respect to the third bullet point, Smith et al. use an accelerator in concert with the anhydride hardener. They do not use a zinc naphthenate accelerator; rather, they use a dimethylbenzylamine accelerator.

Like Smith et al., Mertens et al. teach epoxy resin systems used to impregnate electrical insulating tapes/windings. They disclose, “Also suitable for the method of the instant invention are resinous systems capable of a poly-addition reaction. Examples are epoxy-resin-accelerator mixtures with acid-anhydride hardeners. The poly-addition reaction of such resin-hardener mixtures can be accelerated by using additional compounds,” (column 2, line 68 through column 3, line 1). Exemplary accelerators include dimethylbenzylamine and zinc naphthenate.

The teachings of Mertens et al. demonstrate that these are equivalent accelerators for epoxy/anhydride resin systems used to impregnate electrical tapes/windings. In light of this, it has been found that the substitution of materials known for the same purpose is *prima facie* obvious – see MPEP 2144.06.

Art Unit: 1712

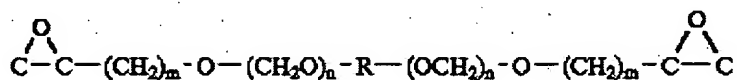
Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the dimethylbenzylamine accelerator of Smith et al. with a zinc naphthenate accelerator because the teachings of Mertens et al. demonstrate that these are known equivalent accelerators for epoxy/anhydride resin systems used to impregnate electrical tapes/winding.

Response to Arguments

9. Applicant's arguments filed November 20, 2006 have been fully considered but they are not persuasive.

The first argument states that the Cook patent specifically teaches that the very “nature of the invention” of Cook is the synthesis of composites by the reaction of alumoxanes with low molecular weight polymer precursors.” (column 17, lines 55-59) The traditional epoxides of Cook fall into the category. Importantly, however, the LCT epoxy of Smith is a high molecular weight polymer. Thus, Cook on its face teaches away from any application to the LCT epoxy of Smith.

The Examiner respectfully disagrees. Smith et al. disclose an epoxy resin of the following formula:

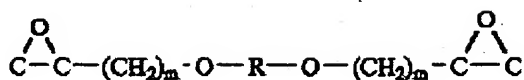


wherein: m is an integer of 1-20;

n is an integer of 0-20; and

R is a mesogen selected from the set consisting of (a)-(p)

Furthermore, when n is 0, the structure looks like this:

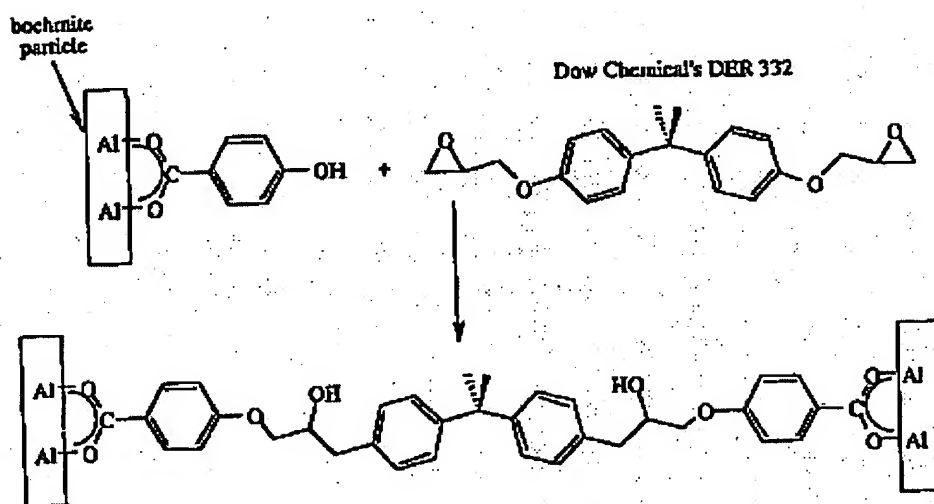


wherein: m is an integer of 1–20;

n is an integer of 0–20; and

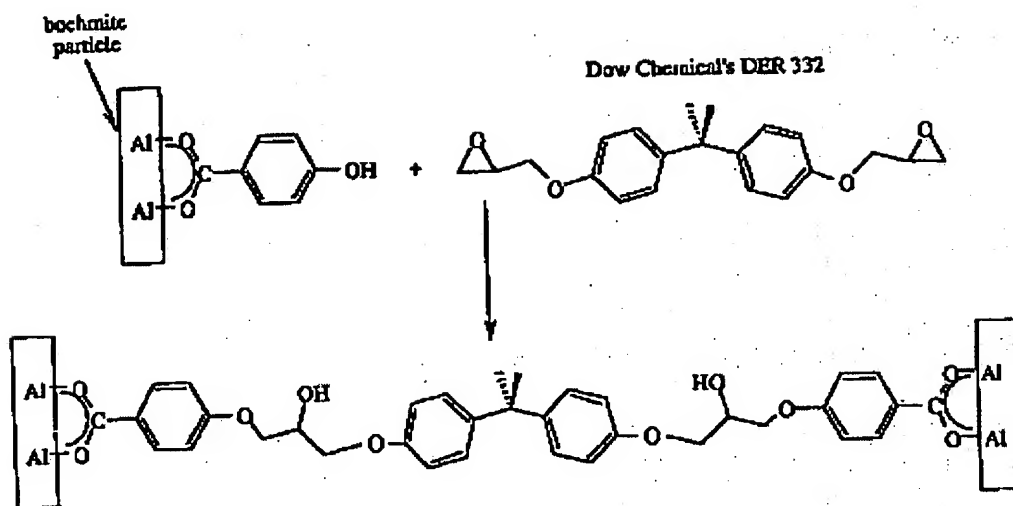
R is a mesogen selected from the set consisting of (a)–(p)

Cook et al. disclose a carboxylate-alumoxane/epoxy hybrid material formed from the following reaction (*also see Figure 10*):

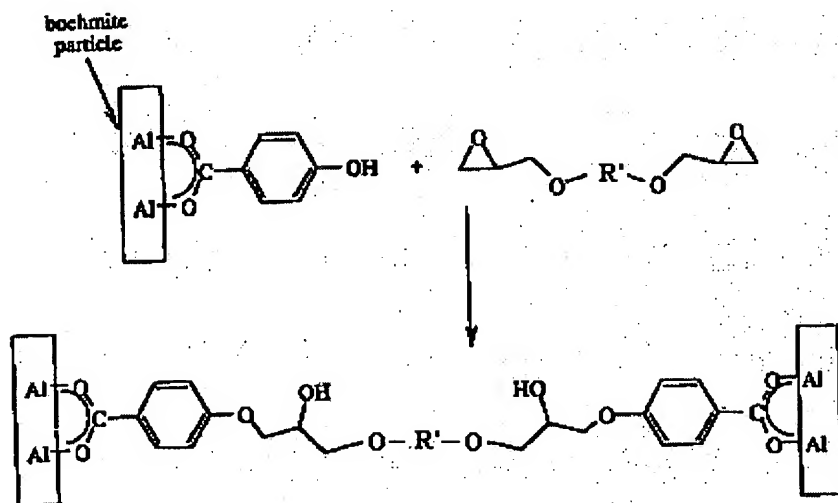


It should be noted that reaction mechanism presented by Cook et al. is slightly flawed in that they fail to account for the oxygen atoms bound directly to the bisphenol group after the ring-opening reaction takes place – the reaction is not atomically balanced. One skilled in the art would have recognized that these oxygen atoms do not participate in the ring opening reaction. Hence, the following would more accurately represent the reaction mechanism of Cook et al. :

Art Unit: 1712



This can be represented in a more generic fashion as follows:

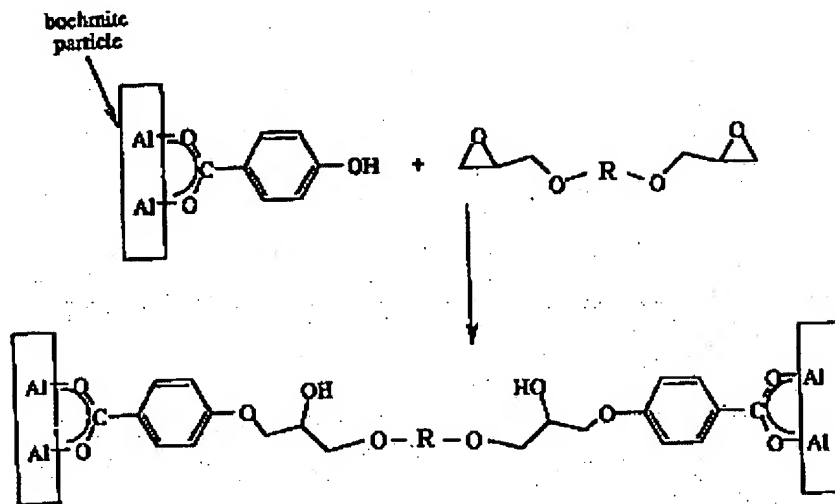


wherein R' is a bivalent skeletal structure.

Turning to the instant invention, Applicant discloses a very similar hybrid material wherein carboxylate-alumoxanes are reacted with a "LCT-epoxy" resin (*see paragraphs 0034-0035*). In their example, they use a biphenol LCT-epoxy; however, they disclose that Examples of other LCT's can be found in US Pat. No. 5,904,984, *which is Smith et al.* The reaction mechanism of the instant invention involves reacting two carboxylate-alumoxanes and an "LCT-

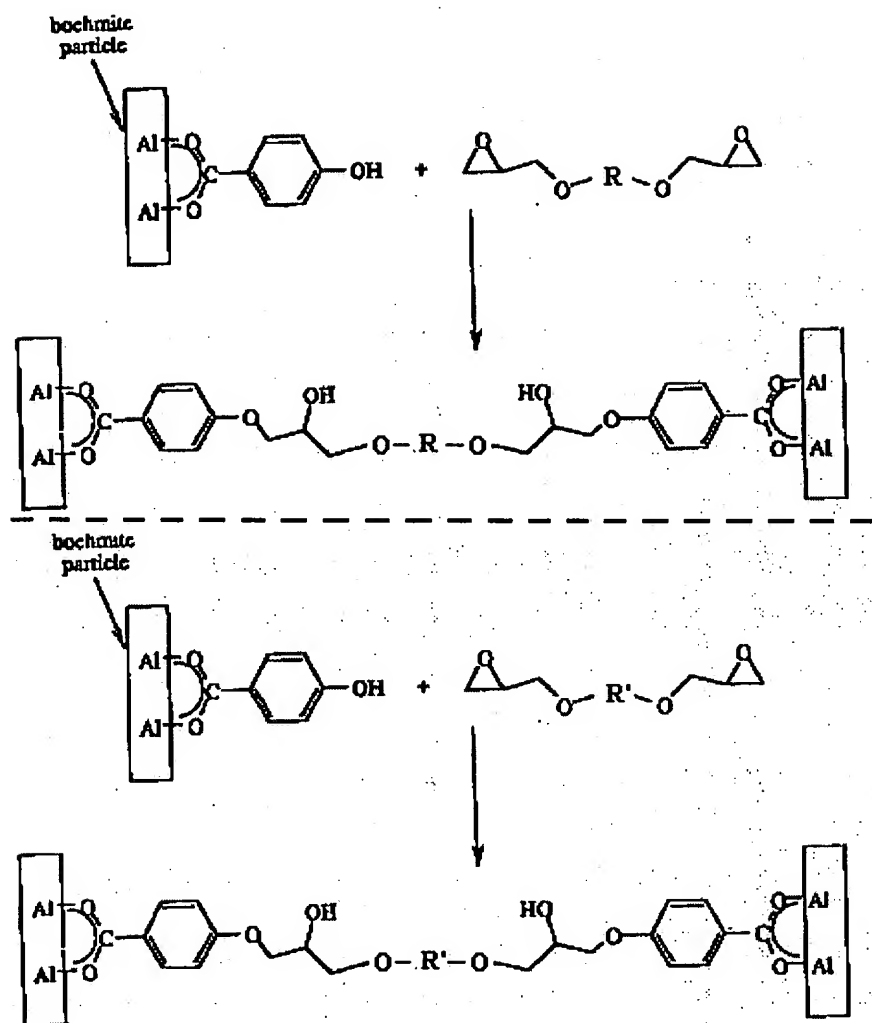
Art Unit: 1712

epoxy" resin of Smith et al. Therefore, in its simplest form ($n=0$, $m=1$), the instant invention is formed by the following reaction mechanism:



wherein R is a bivalent mesogen skeletal structure.

The following is a side-by-side comparison of the reaction mechanism of the instant invention (top) and the reaction mechanism of Cook et al. (bottom). The only difference here is the presence of R (bivalent mesogen skeletal structure) vs. the presence of R' (bivalent generic skeletal structure). *This difference would not distinguish one from the other as being high-molecular weight vs. low-molecular weight.* The foundation of the obviousness rejection is based on this similarity. It is further supported by the fact that Cook et al. extends their reaction mechanism to include *any commercially available epoxy resin*, and that their hybrid materials are used as an alternative to adding fillers.



In other words, Cook et al. teach the same reaction mechanism, except that they do not explicitly disclose the use of mesogen-containing epoxy resins. Based on the extended teachings of Cook et al. it would have been obvious to substitute the generic diepoxide resin with mesogen-containing diepoxide resins, such as those taught by Smith et al., because the skeleton structure appears to have no impact on the reaction mechanism. *These different skeleton structures also would not distinguish one from the other as being high-molecular weight vs. low-molecular weight.* Such a substitution would have yielded the exact same reaction mechanism of the

Art Unit: 1712

instant invention (*see above and paragraphs 0034-0035 of the specification*). Furthermore, it has been found that a chemical and its properties are inseparable. In light of this, the claimed properties would have been an inherent result of these combined teachings.

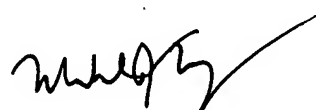
The second argument reiterates the content of the declaration under 37 CFR 1.132 filed on November 20, 2006. As set forth above, a prior art reference typically contains multiple embodiments. Not all of these embodiments may be relevant to a prior art rejection, and by no means do these irrelevant embodiments disqualify the reference as a whole. The statements of Mr. Smith have isolated alternative embodiments of Cook that he believes are inoperable with the teachings of Smith. Without any data to substantiate these claims, it cannot be determined if these statements are accurate. Furthermore, assuming accuracy of these statements, the inoperability of these alternative embodiments does not take away from the embodiments that are relevant to the instant claims. To say that these relevant embodiments are inoperable suggests that the instant invention, itself, is inoperable.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Michael J. Feely
Primary Examiner
Art Unit 1712

December 20, 2006

MICHAEL FEELY
PRIMARY EXAMINER